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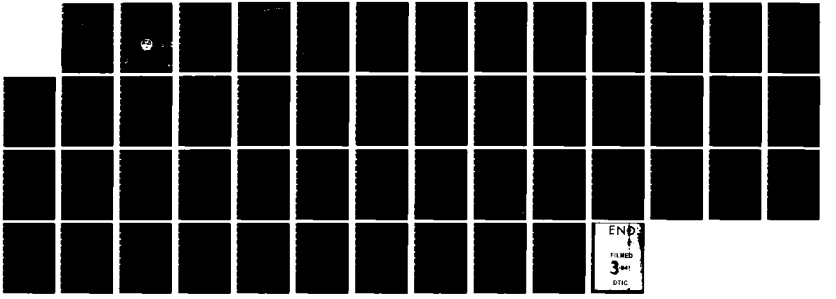

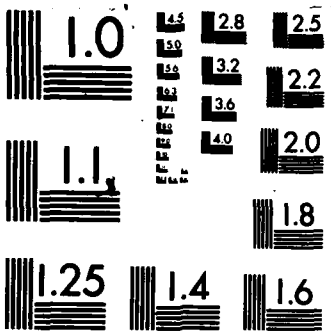

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This report lists all unclassified technical reports, special reports, and technical notes that have been published by the Center in FY 1983. Publications in each category are listed in chronological order under seven areas: manpower management, personnel administration, organization management, education and training, human performance, R&D methods and techniques, and bibliographies, reviews, and summaries.

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FOREWORD

This report lists all unclassified technical reports, special reports, and technical notes that were published by this Center in FY 1983. Publications in each category are listed in chronological order under seven areas: manpower management, personnel administration, organization management, education and training, human performance, R&D methods and techniques, and bibliographies, reviews, and summaries.

Qualified users may request copies of technical reports from the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314 (Telephone: Commercial (202) 274-7633 or Autovon 284-7633). Technical reports listed that have unlimited distribution can also be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (Telephone: Commercial (703) 487-4650 (no autovon)).

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MANPOWER MANAGEMENT

TECHNICAL REPORTS

Civilian Manpower Planning Model for Scientific and Engineering Personnel in the Navy Research and Development (R&D) Centers. TR 83-12. February 1983. T. T. Liang.

This report describes a civilian manpower planning model for scientific and engineering personnel in Navy R&D Centers that is capable of providing alternative projections by age and grade based on various policy scenarios. The projections include the total number of personnel, the number of personnel to be hired, and expected levels of promotion and attrition. The model has been used for the offices of the Assistant Secretary of the Navy and the Chief of Naval Material to estimate the effect of high-grade limitations on the Navy R&D Centers.

Feasibility of Modelling the Supply of Older-age Accessions. TR 83-17. May 1983. G. Thomas.

This report presents the results of an analysis to determine the feasibility of conducting accession supply modelling for older-age individuals. Current recruiting and demographic trends indicate a need for such modelling. The methodology of supply models is discussed and the availability of data is assessed. The report concludes that it is feasible to model the supply of older-age enlistees and discusses procedures for undertaking such supply modelling.

Enlisted Personnel Turbulence Data Base. TR 83-20. June 1983. J. Silverman and T. J. Thompson.

The data base contains quarterly losses and end strengths (FY78-FY82) for enlisted personnel. These data are aggregated by activity type, duty location (sea/shore), pay-grade group, rating group, fleet (Atlantic/Pacific), and length of service. The enlisted survival tracking file (STF) was the primary source for construction of this data base. Organizational turnover rates can be used to evaluate the effectiveness of the "personnel delivery system" in maintaining organizational stability.

MINIFAST: An Interactive Enlisted Personnel Planning Model. TR 83-23. June 1983. R. Stephan and D. Campbell.

A model of the enlisted personnel system (MINIFAST) is described in terms of stocks and flows. The model describes system behavior for some given policy scenario under a fixed set of mathematical assumptions. MINIFAST has been installed in an interactive computer environment. The user can interactively input personnel objectives and then determine the effect of changes in policy in satisfying those objectives. The model can operate at the ALNAV or rating level, but not both simultaneously. Although its methodology resembels that of FAST, the "mainframe" enlisted personnel projection model, it sacrifices some detail and makes some assumptions in order to operate interactively.

Base Force Retention Rate (BFR): An Improved Measure of Navy Officer Retention. TR 83-24. July 1983. E. S. Bres and M. W. Rowe.

The retention rate (RR) is a measure currently used by offices of the Deputy Chief of Naval Operations (Manpower, Personnel, and Training) (OP-01) to assess the

Navy's ability to build and maintain a "career force" of officers. This rate employs the minimum service requirement (MSR) as a point of reference. However, since the MSR frequently does not reflect an officer's true obligation, the RR tends to be overstated. As a result, the maintainability of the career force is overstated.

This report describes the base force retention rate (BFR), an alternative to the RR. The BFR does not rely on MSR-based computation but, rather, is the proportion of officers with between 5 and 10 years of service who resign their commission annually. The report includes illustrations of the BFR's usefulness in identifying changes or trends in an officer community's retention behavior--trends that the conventional RR might not reveal or might only uncover much later than would the BFR.

A Model for Estimating the Base Operating Support (BOS) Required to Support Navy Training Activities. TR 83-26. July 1983. R. King, P. Hudak, and J. Ganeshan.

The objective of this effort was to develop manpower-estimating equations to forecast aggregate manpower requirements within the base operating support (BOS) sector of Navy training activities. Training activities were organized into training "complexes" according to like geographic location. Data on the physical size and population supported by the training complex were matched with measures of student workload; that is, workload imposed by mission-related forces resident at the complex. Multiple regression analysis produced a two-part statistical model for total BOS-training manpower. The real property maintenance component of the model is driven by facility size; and the other base services component, by student workload (tenant population at naval air stations). Therefore, the resulting model separates the generally constant manpower required to maintain an activity of a certain size from the BOS requirements generated by the primary base mission.

Methods for Forecasting Officer Loss Rates. TR 83-30. August 1983. B. Siegel.

The officer retention forecast model (ORFM) is an integrated set of time-series and econometric models that produce loss rate forecasts for the structured accession planning system for officers (STRAP-O). Loss rate forecasts are generated over a 7-year horizon. The manager has the capability to alter these forecasts through a change in the real value of military pay or through the selection of the forecasting technique. This report describes the structure of ORFM and illustrates its capabilities.

SPECIAL REPORTS

The Interrelationship of Personnel Losses, Promotions, Tour Lengths, and Navy Manning. SR 83-15. February 1983. S. W. Sorensen and D. E. Cass.

The objective of this report is to document efforts to develop and verify the theoretical interrelationships of losses, promotions, and tour lengths and their impact on Navy manning by pay grade and duty type. Theoretical models were developed for rotation, average tour length, and manning. Cohort analysis using longitudinal data for the boiler technician (BT) rating was applied to verify the theory. Cohorts were defined as populations entering either a new pay grade or duty type.

MANPOWER MANAGEMENT (Continued)

Results showed that two major cohorts--promotions-in and rotations-in--for a pay grade/duty type have significantly different survival behavior patterns and comprise unequal proportions of manning. Average tour length was verified to be a function of assigned tour length and the continuation rate. Sea tour lengths longer than 3 years did not increase sea manning at the pay grade for which the tour was assigned but did impact sea manning at the next higher pay grade. Results clearly indicate that any sea-shore rotation model must include the effects of promotions and losses.

The Navy Officer Force Projection (OPRO) Model. SR 83-17. March 1983. M. Chipman.

The officer force projection (OPRO) model is an inventory projection technique embedded in the structured accession planning system for officers (STRAP-O). Using predictions of personnel flow rates, a starting inventory is successively projected (by year) into the future. This allows a manager to assess the feasibility of manpower goals, test the sensitivity of the force to policy changes, and develop promotion and accession plans. This report describes the structure and mechanics of the OPRO model and illustrates its capabilities with several applications.

TECHNICAL NOTE

Forecasting Contracting Workload and Manpower Requirements at Navy Supply Activities. TN 83-3. January 1983. A. R. Walker.

This report describes a quantitative forecasting tool used to project workload at Navy contracting offices and relate this workload to the manpower needed to accomplish it. The analysis demonstrated that workload at contracting offices has been increasing due to inflation and the arbitrary ceiling on the maximum dollar amount for a small purchase. The results of this effort were used by the Navy as quantitative justification for a change in the small purchase ceiling from $10,000 to $25,000, which was subsequently enacted into law.

The workload and manpower analysis system (WAMAS) developed as a result of this analysis is operational at the Argonne National Laboratories computer facilities. It was designed to aid in the allocation of contract administration manpower resources.

PERSONNEL ADMINISTRATION

TECHNICAL REPORTS

Trainability Testing for Navy Selection and Classification. TR 83-25. July 1983. A. I. Siegel.

The miniature training and evaluation (MTE) approach to personnel selection involves training a person on a sample of the tasks of a job and then testing him or her on task performance. People who show ability to learn to perform a sample of a job's tasks are assumed to be able to learn the whole job, given appropriate on-the-job training.

A ten-exercise MTE battery (MTEB) was administered to 1034 Navy recruits who were ineligible for assignment to Navy schools. Follow-up data were collected after 9 and 18 months. The MTEB exercises were judged to be at an appropriate difficulty level, to possess acceptable discriminating power, and to be adequately unidimensional. The predictive validity of the exercises was found to be moderate. An increase in predictive power was evidenced in the MTEB exercises employed in conjunction with the ASVAB. The results are interpreted to support the value of the MTE exercises developed for this study and the MTE concept itself.

Relationship Between Corresponding Armed Services Vocational Aptitude Battery (ASVAB) and Computerized Adaptive Testing (CAT) Subtests. TR 83-27. August 1983. K. E. Moreno, C. D. Wetzel, J. R. McBride, and D. J. Weiss.

The relationship between selected subtests from the Armed Services Vocational Aptitude Battery (ASVAB) and corresponding subtests administered as computerized adaptive tests (CAT) was investigated using a sample of Marine recruits. Results showed that the CAT subtest scores correlated as well with initial ASVAB scores as did ASVAB retest scores, even though the CAT subtests contained only half the number of items. Factor analysis showed the CAT subtests loaded on the same factors as did the corresponding ASVAB subtests, indicating that the same mental abilities were being measured. The Armed Services Qualification Test (AFQT) composite was predicted equally well from either ASVAB or CAT administrations, even though the CAT contained only three of the four AFQT subtests. CAT requires fewer test items to perform the same task as the current paper-and-pencil ASVAB.

Strategy for Enlisting Lateral Entrants via Computer Technology (SELECT): An Automated System for Determining Rating and Pay Grade Qualification for Potential Navy Lateral Entry Accessions. TR 83-33. September 1983. M. A. Hamovitch and M. S. Baker.

This report describes SELECT, a system designed to streamline the process of determining proper ratings and assigning pay grades to potential Navy lateral entry accessions. It uses a cross-reference index that converts civilian occupations to Navy ratings and was developed in both a manual and computerized version. Qualification is based on training and/or work experience, physical and security characteristics, and separately developed skill tests.

Methods to Improve Task Inventory Construction. TR 83-36. September 1983. R. E. Chatfield and M. H. Royle.

Job task inventories that contain task statements that overlap as to content and that are not well organized by duty areas can lead to faulty analysis and misleading

results. This study examined the statistical independence of task statements in two enlisted and two officer job specialities to improve inventory design. Statistical independence was assessed using correlational, factor, and cluster analyses. Results indicated that task statements often were not statistically independent, particularly in equipment-oriented job specialities and at the lowest and highest pay grades. Information on item independence can be used to (1) combine items and, thus, shorten inventories, (2) identify poorly written items, and (3) form blocks of related items for ease of inventory completion and analysis.

SPECIAL REPORTS

Development of Armed Forces Qualification Test (AFQT) Deliberate Failure Keys for Armed Services Vocational Aptitude Battery (ASVAB) Forms 8, 9, and 10. SR 83-4. November 1982. L. Swanson and P. Foley.

The Armed Forces Qualification Test (AFQT) score, which is computed from scores obtained on certain subtests of the Armed Services Vocational Aptitude Battery (ASVAB), is used for screening military applicants and would be used for registrants if a draft were resumed. Under a draft, some registrants would probably deliberately fail the screening test to avoid military service. The purpose of this research was to develop deliberate failure keys (DFKs) for AFQT scores derived from the ASVAB forms in operational use (8, 9, and 10). Resulting DFKs, which were constructed by selecting AFQT item alternatives that are responded to differently by true failure (TF) and deliberate failure (DF) groups, appear to be sufficiently valid for classifying examinees into DF, TF, or undetermined categories. Use of the DFKs in a draft would materially reduce the processing workload at military enlistment processing stations. It was recommended that (1) DFKs developed be used in the event a draft is resumed, (2) DFKs be constructed for follow-on forms of ASVAB 8, 9, and 10, and (3) DFKs be developed for computerized adaptive ASVAB tests currently being developed.

Evaluation of the Navy's Recruiting Assistance Program as a Peer Networking Strategy for Recruiting the 19- to 23-Year-Old Market. SR 83-11. January 1983. K. Fernandes.

To evaluate the effectiveness of the Navy's Recruiting Assistance Program (RAP) for recruiting the 19- to 23-year-old age group, a variation of RAP was designed that manipulated the age and type of RAP participants, the number of participants per recruiting station, and RAP utilization by recruiters. Although the field test of this variation was cancelled due to problems encountered in early phases, a recruiter training guide on RAP selection and supervision was developed that could be used to improve RAP operation at the local level. Information obtained during the development of the peer networking strategy was used to generate recommendations regarding program eligibility criteria, processing procedures, and utilization of RAP participants.

Enlisted Personnel Individualized Career System (EPICS) and Conventional Personnel System (CPS): Preliminary Comparison of Training and Ancillary Costs. SR 83-23. April 1983. A. M. Megrditchian.

The objective of this effort was to estimate and compare the formal training and ancillary support costs required to qualify fire control technicians to operate and

maintain the NATO Seasparrow Surface Missile System using EPIC and conventional personnel system (CPS) paths. Results showed that, in the case of a new weapon system, requiring the training and support of technicians, EPICS costs would be about 19 percent less than CPS costs for a 200-man cohort and about 25 percent less for a 500-man cohort. In the case of an existing weapon system, where CPS curriculum and materials are available, EPICS costs would be about 7 percent more than CPS costs for a 200-man cohort and about 13 percent less for a 500-man cohort. For initial skills training only, EPICS costs would be about 32 percent less than CPS costs for both cohorts.

Field Evaluation of Enriched Hybrid Job Performance Aids. SR 83-32. May 1983. M. G. Smith and T. J. Post.

Twenty Navy technicians participated in a field evaluation of the effectiven of enriched hybrid job performance aids (EHJPAs) for troubleshooting the AN/AW 10 airborne weapon control system. In a between-subjects design, each group us one of four troubleshooting formats on two troubleshooting tasks: (1) deduct information only (DED), (2) hybrid aid without any enrichment (UN) (3) an enrich hybrid (TS/IC), and (4) another enriched hybrid with technical data referenc (SS/BRC). Performance across tasks, as well as performance on a pre- and posttask using the DED, format were compared. Using the TS/IC format, technicians solved the two tasks 58 percent faster than did the technicians using DED. Improvement from the pre- to posttasks for the TS/IC group was 65.6 percent, compared to 31.9 percent for the DED group. One hundred percent of all hybrid groups solved the posttask, compared to 83 percent of the DED group. One hundred percent of all hybrid groups said the hybrid aids were easier to use and understand than existing technical material. In a test on system knowledge, the SS/BRC group was superior when compared to the other groups. Combining the results with the user preference for the SS/BRC format, it was concluded that the SS/BRC was the most effective EHJPA.

Navy Personnel Accessioning System (NPAS): I. Background and Overview of the Person-Job Matching (PJM) and Recruiting Management Support (RMS) Subsystems. SR 83-34. May 1983. H. G. Baker.

This report documents the conceptualization and design of a proposed prototype computerized Navy Personnel Accessioning System (NPAS) suitable for use in Navy recruiting stations. NPRDC Special Reports 83-35 and 83-36 respectively provide a summary of research and development efforts and products resulting from the NPAS project and the development of a microcomputer-based demonstration system.

Navy Personnel Accessioning System (NPAS): II. Summary of Research and Development Efforts and Products. SR 83-35. May 1983. H. G. Baker.

This report provides a summary of the research and development (R&D) efforts completed on the Navy Personnel Accessioning System (NPAS) project and listings of R&D products resulting from that project. NPRDC Special Reports 83-34 and 83-36 respectively describe the conceptualization and design of NPAS and the development of a microcomputer-based demonstration system.

PERSONNEL ADMINISTRATION (Continued)

Navy Personnel Accessioning System: III. Development of a Microcomputer Demonstration System. SR 83-36. May 1983. H. G. Baker, B. A. Rafacz, and W. A. Sands.

This report describes the development of a demonstration version of the Navy Personnel Accessioning System (NPAS) capable of running on a stand-alone microcomputer in the Navy recruiting station environment. NPRDC Special Reports 83-34 and 83-35 describe the conceptualization and design of NPAS and provide a summary of R&D efforts and products resulting from the NPAS project.

Evaluation of a Tailored Direct-mail Marketing Strategy for Recruiting the 19- to 23-Year-Old Market. SR 83-38. May 1983. K. Fernandes, A. P. Romanczuk, B. E. Goodstadt, and C. L. Colby.

In a direct-mail campaign, materials tailored to the interests of 19- to 23-year-olds were distributed to subscribers of five selected automobile and motorcycle magazines with a high proportion of readership in this age group. The strategy was evaluated by comparing the number of enlistments in this group of subscribers with the number produced in a group who did not receive the materials. The direct-mail campaign did not have a significant impact on enlistment rates and was not effective in appealing to the target population of 19- to 23-year-olds. Factors considered in interpreting the lack of impact were the size of the direct-mail campaign, the type of design used to evaluate impact, the extent to which the matrials appealed to target group members, and the recruiting environment in which the field test was conducted.

Proceedings of an Invitational Conference on Job Performance Aid Cost Factors. SR 83-39. June 1983. G. A. Osga and R. J. Smillie.

An invitational conference, sponsored by the Navy Personnel Research and Development Center, was held on 2-3 June 1982. The purpose of the conference was to identify factors influencing job performance aid cost and to determine methods for measuring and predicting these factors. Three government (Army, Navy, and Air Force) and eight industrial (researchers and developers) representatives participated. This report gives each participant's presentation, a summary of the discussions following each presentation, an overall summary of the cost factors identified, and the conclusions regarding cost prediction.

Implementation of Microfiche Image Transmission System (MITS): A Multifaceted Assessment of Demonstration Installation. SR 83-40. June 1983. J. P. Sheposh and V. N. Hulton.

A multifaceted approach was employed to evaluate the introduction and implementation of a technological system--the microfiche image transmission system (MITS). Four different aspects of the demonstration installation were investigated: (1) operators' perception of MITS, (2) the requesters' acceptance of the services provided, (3) image quality, and (4) management's evaluation of the MITS implementation. The results revealed that the operators' perceptions of MITS were positive, the requesters regarded MITS as highly satisfactory, the image quality of the facsimile input fiche was judged superior to the MITS output, and the managers and developers regarded the MITS implementation as a success. Issues concerning widespread application of MITS were seen as premature at this time.

TECHNICAL NOTE

A Person-Job Matching (PJM) System for Navy Recruiting: Background and Needs Assessment. TN 83-7. May 1983. H. G. Baker.

Navy recruiting needs in the areas of (1) screening, (2) vocational guidance, (3) assignment, and (4) systems approach to personnel accessioning were accessed through interview, questionnaire, and literature search. Based on results, recommendations were made for the enhancement of the person-job matching (PJM) functions at recruiting stations.

ORGANIZATION MANAGEMENT

TECHNICAL REPORTS

The Impact of Goal Setting and Feedback on the Productivity of Navy Industrial Workers. TR 83-4. January 1983. K. S. Crawford, M. A. White, and P. A. Magnusson.

The objective of this effort was to implement and evaluate a goal-setting program for industrial workers at a naval air rework facility (NARF). This program attempted to improve worker motivation and productivity by integrating a new work measurement system with individual goal setting and feedback. Results indicated that workers with performance goals significantly improved their efficiency; workers with the most difficult goals improved the most. No difference was found between assigned and participative goal-setting groups. The program had a stronger positive effect on workers who were initially low performers than on those who were initially high performers. It was recommended that NARFs consider using the newly developed performance measurement system for goal setting and feedback as well as to provide worker efficiency data for their performance appraisal programs.

Surface Warfare Junior Officer Retention: Background and First Sea Tour Factors as Predictors of Continuance Beyond Obligated Service. TR 83-6. January 1983. T. M. Cook and R. F. Morrison.

This report is the fifth in a series that addresses factors that affect the early career/professional development and retention of junior surface warfare officers (SWOs). The sample consisted of 128 junior SWOs commissioned during 1974-75 who had responded to a career development questionnaire in early 1979. Of these, 58 (45%) had left service at the end of obligation and 70 (55%) remained on active duty (as of September 1981). Background and first sea tour factors were used to predict career intent and continuance. Results showed that career intent was substantially associated with a combination of first sea tour work experiences and percentages. Career intent, in turn, was found to account for substantial variance (R^2 = .25) in the continuance criterion. Results strongly supported the hpothesis that continuance decisions are the product of early Navy work experiences (e.g., opportunities, assignment patterns, etc.). Results are discussed with attention to leadership, assignment, and policy implications.

Implementation of Planned Change: A Review of Major Issues. TR 83-7. February 1983. J. P. Sheposh, V. N. Hulton, and G. A. Knudsen.

Pertinent literature was reviewed to provide a perspective for the study of change in organizations. This review focused primarily on the major issues identified in implementing organizational change with special emphasis on the role of management in this process. Based on a review of the findings, it was concluded that implementation can best be understood in functional terms. Several recommendations are made to aid researchers and practitioners in the investigation, application, and understanding of change processes.

Correctional Retraining in the Navy: Follow-up Evaluation. TR 83-8. February 1983. L. M. Doherty, S. F. Bacon, M. B. Cowen, and N. B. Rappaport.

The objectives of this effort were (1) to conduct a follow-up evaluation of the effectiveness of pilot retraining programs at correctional custody units (CCUs) especially established for retraining at Pearl Harbor, Hawaii, and Coronado, California and at a Behavior Skill Training (BEST) Unit established at Norfolk,

Virginia in improving performance and reducing disciplinary problems (recidivism) and attrition, and (2) to determine the survival rates of individuals assigned to CCUs (including those at Coronado and Pearl Harbor) and brigs during FY81. For the retraining (longitudinal) sample, performance was measured through supervisory ratings obtained at various intervals. For the longitudinal and FY81 samples, recidivism was measured by determining the number of times assignees had been reassigned to a CCU or brig following retraining; and attrition, by using two survivability measures. Results showed that the retraining programs at CCUs Pearl Harbor and Coronado and BEST were effective in improving performance and in reducing recidivism and attrition. No significant differences were found between results of the previous and current evaluations of these programs. The survivability rates for those assigned to CCUs or brigs during FY81 varied widely. However, only 43 percent of those assigned to brigs are still in the service or have successfully completed service, compared to 71 percent for CCUs.

Gender Differences in the Evaluations of Narratives in Officer Performance Ratings. TR 83-14. March 1983. P. J. Thomas, B. L. Holmes, and L. L. Carroll.

The narrative sections of the Reports on the Fitness of Officers (FitReps) for 239 unrestricted line officers were compared for gender differences. A content analysis was conducted and the descriptors applied to naval officers of each gender were tallied. Significance tests were conducted to determine whether the number of descriptors within each category or the nature of the descriptors differed by gender. In addition, cluster and discriminate analyses were performed on the personality traits appearing in the evaluation.

Men's evaluations were significantly longer than were women's, contained more comments about their warfare-skill potential and impact on the Navy, contained more recommendations for future assignments, and used different words to describe their behavior. Men were seen as more qualified, logical, dynamic, mature, and aggressive than were women. Male officers were described as being effective in training others and physically fit, possessing the Navy image, having supportive wives, and improving their commands. Female officers, more so than males, were described as supporting equal opportunity, appearing impecable in uniform, and being an asset to their commands. Using the significant gender differences uncovered in the analyses, two pseudo-narratives were written without any gender-identifying pronouns--one describing a female lieutenant and the other, a male lieutenant. Mid-level officers, who were asked to judge the promotability of the two pseudo-lieutenants, overwhelmingly chose the man.

Marine Corps Recruit Training Attrition: The Effect of Realistic Job Preview and Stress-coping Films. TR 83-18. May 1983. W. H. Githens and J. Zalinski.

To reduce recruit training attrition, the Marine Corps had two training films developed: The Beginning, a realistic job preview (RJP) film and Making It, a stress-coping (SC) film. To evaluate the films' effectiveness in reducing attrition, platoons of Marine recruits were randomly assigned to four treatment groups: viewing the RJP film, viewing the SC film, viewing both films, or viewing neither film (control group). There were no statistically significant differences in recruit training attrition among the treatment and control groups. Also, attrition rates among the individual platoons differed significantly.

ORGANIZATION MANAGEMENT (Continued)

First-term Attrition Among Marine Corps Women: Some Associated Factors. TR 83-22. June 1983. M. H. Royle.

The first-term attrition rate for enlisted Marine Corps women is nearly 50 percent, about twice that for comparable men. To identify factors that might be related to attrition, three data sets were analyzed. They included historical master files and recruit accession management system files, a 3-year follow-up on a recruit-training attrition study using expectations to predict attrition, and a job-satisfaction survey. Results indicated that most of the difference in post-recruit training attrition between men and women was due to pregnancy. Background variables were of limited usefulness in predicting attrition. Factors associated with Marine Corps experience, particularly in the work setting, appeared to be related to attrition. The data did not support the hypothesis that women are becoming pregnant in order to be discharged. Further investigation of these experience factors is recommended, in addition to investigation of training in sex education and life-decision making. Placement of women in units with at least one other woman and use of information on women's interests in sports and nontraditional activities in recruiting are also recommended.

Productivity Improvement in a Purchasing Division: Evaluation of a Performance Contingent Reward System (PCRS). TR 83-34. September 1983. D. M. Nebeker, B. M. Neuberger, and V. N. Hulton.

Performance contingent reward systems (PCRSs) were developed for small purchase buyers and supply clerks in a purchase division of a naval shipyard supply department. The rewards were financial incentives provided to individual civil service employees performing above standard. Description of the system and an evaluation of its effectiveness in increasing productivity and saving costs are provided. Results showed that systems increased productivity substantially and were cost effective.

Individual Performance Measurement and Reporting in a Navy Industrial Organization. TR 83-35. September 1983. D. A. Mohr, E. C. Shumate, and P. A. Magnusson.

This report describes the operations performance tracking system (OPTS), an automated individual performance measurement and reporting system designed for industrial employees of naval air rework facilities (NARFs). OPTS extracts and organizes existing management information system data to provide individual performance measures and reports. It was implemented in the Power Plant Division at NARF Alameda and can be used at NARFs elsewhere. The measures provided by OPTS can be used to support productivity improvement techniques such as performance feedback, goal setting, performance appraisal, and incentive awards.

SPECIAL REPORTS

Characteristics and Needs of Navy Families: Policy Implications. SR 83-1. October 1982. A. J. Farkas and K. P. Durning.

A stratified random sample of 2,126 Navy men and women with dependents was surveyed to assess the characteristics and needs of Navy families. Information was

obtained concerning Navy family demographics, serious problems encountered by Navy families, differential problems of men and women, as well as officer and enlisted personnel, sources of social support and services, and the effects of family variables on reenlistment intentions. Family variables were found to have major impact on reenlistment intentions.

Racial/Ethnic and Gender Differences in Responses to the Human Resource Management Survey of Personnel Assigned to the Atlantic and Pacific Fleets. SR 83-10. January 1983. P. J. Thomas and S. W. Conway.

The purpose of this study was to analyze the fleet equal opportunity climate of the human resource management (HRM) survey in compliance with the FY82 Navy Affirmative Action Plan. The most recent 1-year data base (1 July 1980 to 30 June 1981) of HRM survey responses was used, yielding a sample of 35,690 personnel. The responses of whites and blacks, whites and Hispanics, whites and Filipinos, blacks and Hispanics, and men and women were compared by analyses of variance and t-tests for the difference between means.

Effects of Race and Gender on Court-martial Rates and Punishments. SR 83-20. March 1983. S. W. Conway.

The purpose of this effort was to determine whether court-martial rates and type of punishments awarded are related to race or gender. The sample included all first-term enlisted personnel who had received one or more courts-martial within the period from May 1981 to April 1982 and for whom demographic data were available. Frequencies of number of offenses and offenders were determined to find percentages by race and gender; punishments awarded by court-martial were analyzed to find if there were differences between races or genders. There was no evidence that any one racial group was over represented at court-martial. Women were awarded courts-martial at disproportionately low rates, comprising only 2 percent of offenders. Analysis of punishments awarded by race within type of court revealed six significant differenes, five of which indicated that offenses of minority personnel resulted in harsher sentences than did white offenses.

Completion of the First Enlistment by Female Personnel: A Prediction Study. SR 83-41. June 1983. G. L. Wilcove.

Two questionnaire forms--QUEST 1 and QUEST 2--were developed and one or the other was administered to approximately 1,000 female Navy recruits. The questionnaires included items under eight categories--personal history, female role ideology, mental health, motivation to fail, realistic expectations about the Navy, motivation to enlist, similarity to successful recruits, and occupational needs. In an attempt to predict attrition during the first enlistment, seven scales were developed using validation samples. These scales were scored in three different ways using cross-validation samples, and correlation coefficients were computed. Results showed that 13 of 21 scale scores were significantly correlated with attrition, the highest correlation being .25. The practical significance of this correlation was evaluated using Taylor-Russell tables and discriminant analysis.

ORGANIZATION MANAGEMENT (Continued)

1982 Department of Defense Family Housing Preference Survey: I. Management Report. SR 83-47. August 1983. J. K. Lawson, E. P. Somer, B. Feher, and D. Perel.

The 1982 DoD family housing preference survey was conducted to assess service member attitudes toward housing and related issues and, when possible, to compare present attitudes with those obtained in the 1974 DoD family housing preference survey. This report provides highlights of survey results aggregated across services. A subsequent report will provide breakdowns of survey responses by services and discuss implications of those responses in depth.

TECHNICAL NOTES

Variables Predictive of Eligibility and Reenlistment in Three Shipboard Ratings. TN 83-5. February 1983. E. W. Curtis.

Three enlisted ratings (boiler technician, hull maintenance technician, and operations specialist) were analyzed using a little used multivariate technique (THAID). Recommendation for reenlistment of each member and the actual reenlistment/discharge outcome were studied in relationship to a wide range of assignment factors (e.g., durations of assignments, sea vs. shore designations, and ship characteristics). It was found that duration of the first duty assignment was highly correlated with reenlistment. Unauthorized absences and ship type at the first duty station interacted to maximally predict recommendation for reenlistment. Sea duty for the last assignment prior to reenlistment/discharge presaged reenlistment, as did being married. Greatly differing probabilities of reenlistment can be obtained by subgrouping potential reenlistees on the basis of the duration of the first duty assignment, sea vs. shore designation of the last assignment, and marital status.

The Effects of Performance Evaluation Narratives on the Promotion of Male and Female Unrestricted Line (URL) Officers. TN 83-6. May 1983. P. M. Spishock and C. C. Scheifers.

In previous research (NPRDC TR 83-14), two pronoun-free officer fitness report (FitRep) narratives, one containing descriptors typical of a male and the other, descriptors typical of a female, were written and evaluated for selection for promotion. Results showed that evaluators overwhelmingly selected the officer described by the male-archetype narrative. This study sought to determine whether or not a priori knowledge of an individual's gender influences an evaluator's decision in chosing an officer for promotion based on the FitRep narrative portion. To do this, two forms--masculine and feminine--of the male and female archetype narratives were developed by inserting masculine or feminine pronouns as appropriate. Half of the evaluators (arbitrarily selected unrestricted line officers from all communities) were given the male-archetype narrative with masculine pronouns and the female-archetype narrative with female pronouns; and the other half, the male-archetype narrative with feminine pronouns and the female-archetype narrative with masculine pronouns. They were asked to evaluate the narratives and select one of the two officers described for promotion. Results showed that evaluators overwhelmingly selected the officer described by the male-archetype narrative, regardless of whether

feminine or masculine pronouns were used. The findings suggest that competency factors as written in typical fitness reports of male officers have a positive effect on the selection for promotion of male and female officers.

Relationships Between Number of Enlistments Completed and Importance of Separation Reasons: Hierarchical Multiple Regression Approach. TN 83-8. May 1983. L. M. Doherty and M. B. Cowen.

The reasons for separation from the Navy, as identified by responses to the enlisted separation questionnaire (ESQ), were related to Navy tenure. Factor analysis of ESQ responses yielded eight separation reason factors. The number of enlistments completed was found to be inversely related to the importance (in the separation decision) of skill utilization, regimentation, and leadership factors, and directly related to loss of benefits. Hierarchical multiple regression demonstrated differential relationships between mutually exclusive subclasses of individuals for leadership and regimentation.

USS KITTY HAWK (CV 63) Maintenance Support Center: A Preliminary Assessment. TN 83-10. June 1983. R. N. Harris, J. A. Dollard, and J. D. Winchell.

This report presents the results of a preliminary assessment of the maintenance support center (MSC) as implemented aboard USS KITTY HAWK (CV 63). The assessment considers manning, training, organization, and support requirements as related to KITTY HAWK and as necessary for possible MSC implementation aboard other ships of the fleet.

Officer Career Development: Surface Warfare Officer Interviews. TN 83-11. July 1983. R. F. Morrison.

This investigation was conducted to allow the research staff to become familiar with surface warfare officer (SWO) career concerns and the situations that appear to create and influence those concerns. Sixty-eight SWOS from grades O-1 through O-6 and assigned to sea tours aboard 10 different ships and a squadron staff participated in unstructured interviews. The officers reported that many organizational structure and management factors affected their opportunity to compete with their peers for promotion and major assignments. Some of those factors were being assigned to engineering, missing operational training, being assigned to a ship in overhaul/nuclear ship/broken-down ship, receiving one poor performance evaluation, and obtaining an SWO device late. Changes in current policy and procedures are proposed.

EDUCATION AND TRAINING

TECHNICAL REPORTS

Close Air Support in an Urban Environment. TR 83-2. November 1982. R. H. Blacksten and R. E. Cooper.

This report documents the research performed under the Marine Corps Urban Area Combat Training Program with regard to close air support (CAS) in the urban environment. First-pass ordnance release probability distributions for CAS in five characteristic urban areas are determined. Factors affecting CAS target acquisition are identified and their contributing variances are measured.

Job-oriented Basic Skills (JOBS) Training Program: An Evaluation. TR 83-5. January 1983. M. S. Baker and M. Hamovitch.

This report describes the evaluation of four training courses developed under the JOBS program for Navy personnel whose ASVAB scores were below the minimum required for entry into selected Navy Class "A" technical schools. The training courses were designed to increase their mastery of the skills and knowledge deemed to be prerequisites for success in these schools. Data indicates that the JOBS program has the potential for attenuating Navy technical manpower shortages and contributing to minority upward mobility.

Tailoring Shipboard Training to Fleet Performance Needs: V. Design and Production of Training Materials. TR 83-9. February 1983. R. E. Main, J. H. Steinemann, I. J. Rivenes, Jr., and J. G. Chadbourne.

To promote the implementation of the shipboard propulsion plant operator (SPPOT) system within the fleet, it was necessary to provide guidelines and specifications for the development of SPPOT materials. A SPPOT Development Handbook was designed to provide the information required for effective development of SPPOT materials.

Predictors of Performance in Navy Electronics Skills: The Effect of Mathematical Skills. TR 83-10. February 1983. M. S. Baker.

This effort is part of a project designed to identify mathematical requirements relevant to Navy electronics training. The relationship between mathematics ability and electronics performance in the Navy's Basic Electricity and Electronics (BE/E), Class "A," and Class "C" schools was examined to identify the mathematics skills required to complete Navy electronics training successfully and function adequately in electronics maintenance in the fleet. School performance measures were correlated with various predictor measures, and variables were analyzed to determine how they clustered together. Results showed that skills in mathematics knowledge are strongly related to success in electronics schools.

The Effects of the Timing of Feedback on Long-term Knowledge Retention in PSI Courses. TR 83-13. February 1983. K. A. Lockhart, P. T. Sturges, J. Zachai, B. Dubois, and D. Groves.

Several widely used instructional delivery systems include the provision of immediate feedback of test results as a crucial component. Given the cost of such

feedback, the instructional benefits obtained should be verified. This report describes a series of three experiments concerning the effects of timing of feedback on long-term knowledge retention in courses taught according to the personalized system of instruction (PSI).

Experiment I varied only the timing of the feedback. Experiment II varied the timing of feedback, the quality of feedback, and test-item type. Experiment III varied the timing of feedback and test-item type. Analysis of the data showed that neither delayed nor immediate feedback produced superior long-term knowledge retention, regardless of the quality of feedback (within the limitation of these experiments). These results do not support the use of immediate feedback when cost considerations are important. Delayed feedback was as effective in this series of experiments and is far easier to implement in operational training.

Effects of Questions and Instructions on Learning from Text. TR 83-19. May 1983. J. A. Ellis, P. J. Konoske, W. H. Wulfeck, II, and W. E. Montague.

Four experiments were conducted to determine if giving students specific instructions about the nature of the textual material and the final test is as effective as giving them practice questions in learning from text. In all experiments, subjects were randomly assigned to one of four groups: (1) a read-only control group, (2) a practice-questions group, (3) an instructions group, and (4) a practice-questions-plus-instructions group. Results of the experiments indicated that (1) instructions can be as effective and, in some cases, more effective than practice questions in learning from text, (2) instructions control/focus student processing and attention as well as do practice questions, and (3) the best instructional strategy is a combination of instructions and practice questions.

Job-oriented Basic Skills (JOBS) Program for the Acoustic Sensor Operations Strand. TR 83-21. June 1983. P. K. U'Ren and M. S. Baker.

The job-oriented basic skills (JOBS) program was conceived in 1977 to provide training courses for lower-aptitude Navy personnel that would enable them to complete Class "A" technical schools successfully. The purpose of the current effort is to develop a JOBS curriculum for the acoustic sensor operations area. Analyses conducted to ascertain job requirements and basic and prerequisite "A" school requirements showed that "A" school students need training in mathematics, reading, study skills, memorization, science, mechanical relationships, and problem solving. Instructional objectives and specifications based on these requirements were developed to provide a guideline for future curriculum development.

Generalized Maintenance Trainer Simulator: Test and Evaluation in the Laboratory Environment. TR 83-28. August 1983. D. M. Towne, A. Munro, M. C. Johnson, and G. F. Lahey.

Three experiments were conducted to evaluate the effectiveness of the generalized maintenance trainer simulator (GMTS) as a supplementary device for laboratory troubleshooting practice. Students using the GMTS scored as well on final tests of performance on actual equipment as did students who had trained on actual equipment. It was concluded that GMTS provides effective laboratory troubleshooting practice.

EDUCATION AND TRAINING (Continued)

The Instructional Quality Inventory (IQI): A Formative Evaluation Tool for Instructional Systems Development. TR 83-31. August 1983. W. E. Montague, J. A. Ellis, and W. H. Wulfeck, II.

This report describes the development and evaluation of the instructional quality inventory (IQI), a systematic methodology for reviewing instructional material.

SPECIAL REPORTS

Handbook for Testing in Navy Schools. SR 83-2. October 1982. J. A. Ellis and W. H. Wulfeck, II.

This handbook provided by this report provides detailed "how-to" procedures for use by course developers in constructing test items and tests for Navy technical courses.

Organizational-level Electromechanical Simulated Avionics Maintenance Training System: I. Task and Skills Analysis. SR 83-3. November 1982. J. K. Wasik, B. Wood, and D. Coville.

This effort provides a task and skills analysis of the SH-3H blade fold/rotor brake systems for the aviation electrician and structural mechanic maintenance training courses. This information is to be used in the development and evaluation of a prototype simulated avionics maintenance trainer (SAMT) in support of organizational level electromechanical maintenance systems on the SH-3H helicopter.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): VIII. Final Report. SR 83-6. November 1982. D. W. Bergman, G. G. Swenningsen, and R. A. Walker.

This is the last in a series of eight reports concerning the development of air antisubmarine warfare training for acoustic analysts using the digital acoustic sensor simulator (DASS). It describes the development of lessons from a set of lesson specifications developed previously (NPRDC SR 81-23). Lesson development and implementation were curtailed due to the lack of funding, but materials were made available to the Naval Surface Weapons Center, White Oak, for possible further use.

Workbook for Testing in Navy Schools. SR 83-7. November 1982. J. A. Ellis, W. H. Wulfeck, II, and P. S. Fredericks.

This workbook is intended for use in conjunction wiht the Handbook for Testing in Navy Schools (NPRDC SR 83-2), which provides detailed "how-to" procedures for use by course developers in constructing test items and tests for Navy technical courses.

Readability Formulas: Their Application in the Armed Forces. SR 83-8. November 1982. T. M. Duffy.

A review of the use of readability formulas in the military indicated that they are generally invalid and a possible source of significant misjudgments about the

adequacy of written technical materials. Strategies are discussed for predicting comprehension levels for existing text and for ensuring that the initial production of new text will result in a comprehensible product.

Development of a Computer-based Tactical Training System. SR 83-13. January 1983. A. M. Crawford and J. D. Hollan.

Research was designed to evaluate the use of microcomputers for Navy training in a context that would permit the exploration of games for learning declarative information, in situ development of stand-alone computer-assisted instruction (CAI) systems, and techniques for developing automated tutors and student models. A data base of facts involving Soviet platforms and weapons systems was compiled and represented as a semantic network. The data base and a series of drill and practice games were implemented on a TERAK microcomputer and installed at the Fleet Comb. Training Center, Pacific for tactical action officer training. Results of a formative evaluation of the training are described in this report.

Deployable Team Training for Acoustic Analysts and Tactical Coordinators: V. Lesson Specifications. SR 83-16. February 1983. H. D. Kribs, S. I. Windle, and L. J. Mark.

This report, the last in a series of five concerning the development of an air antisubmarine warfare (ASW) team training system for deployed settings, describes the lesson specifications for acoustic analyst/tactical coordinator (AW/TACCO) team training. Previous reports identified the team task listing, the objectives hierarchy, the course syllabus, and management planning considerations (NPRDC SRs 82-10, 82-11, 82-12, and 82-39).

Feasibility of Individualized Instruction for USMC Professional Military Education Programs: Phase I. Implementation at Instructional Management School. SR 83-19. March 1983. M. R. Flaningam and J. N. Joyner.

This report describes the implementation of individualized instruction at a USMC Instructional Management Scchool (IMS), which trains instructors of professional military education courses. The IMS instructor course was converted from fixed-entry, lock-step and lecture-base to variable-entry, self-paced, application-base. Course materials were modularized so that training could be tailored to individual needs.

Effects of Behavioral Objectives and Instructions on Learning a Category Task. SR 83-33. May 1983. P. J. Konoske and J. A. Ellis.

This study compares the effects of behavioral objectives and explicit instructions on learning a category task. Subjects were assigned to one of four groups: a read-only control group, a standard Navy behavioral objective group, a revised behavioral objective group, and an instructions group. Results of a recall test and a classification test showed a significant difference in group performance. The data indicated that giving students explicit instructions or behavioral objectives that have been revised so that they are clear to the student facilitates recall and classification performance more than giving nonspecific behavioral objectives. The instructional implications are that students should be given explicit instructions or behavioral objectives that use familiar terminology and consist of specific information about the nature of the testing situation when learning from text.

Developing an Objectives-based Team Training Course in Active Sonar Antisubmarine Warfare. SR 83-42. June 1983. E. H. Rocklyn, J. M. Olson, and D. P. Zelesnikar.

Combat team training courses are exempt from course development requirements of the Navy's instructional systems development (ISD) program mainly because of the difficulty in constructing team training objectives and tests. The resulting nonstandardized team training results in degradation of fleet combat readiness. A team training course in active sonar antisubmarine warfare (ASW) was developed following the fundamental principles of the ISD process while compensating for the differences between team and individual training. Evaluation of the course by the Fleet Anti-Submarine Warfare Training Center, Pacific and the ship's teams who took the course was uniformly positive. Generalization of this work to other ASW courses and other warfare areas is recommended. This work could also be used as a starting point in developing a Navy-wide guide for constructing, administering, and evaluating combat team training courses.

Evaluation of the CMI Instructor Role Training Program in the Navy and Air Force. SR 83-43. June 1983. B. L. McCombs and K. A. Lockhart.

This report summarizes the background of the CMI instructor role definition and training program and the results of an evaluation of the CMI instructor role training package in selected Navy and Air Force technical training schools. The evaluation results indicate that the package met the goal of providing relevant and needed training in the Navy and Air Force CMI settings. Instructor training in theoretically-based CMI roles was seen as contributing to the more positive student attitudes toward CMI and their CMI instructors in some of the Navy schools selected for the study and to generally lower student elimination rates in the majority of the participating Navy schools and the Air Force school.

Tailoring Shipboard Training to Fleet Performance Needs: VI. Development of Shipboard Propulsion Plant Operator Training (SPPOT) Materials for USS NEW JERSEY. SR 83-44. June 1983. K. A. Johnson, I. J. Rivenes, Jr., and J. G. Chadbourne.

Shipboard propulsion plant operator training (SPPOT) materials were developed for USS NEW JERSEY (BB 62) and were delivered prior to commissioning so as to help the crew prepare for light-off. SPPOT materials provide the information needed to qualify for specific watchstations in the main propulsion spaces on specific ships. This report describes the materials, their development, and the resources that were required.

Handbook for Individualized Instruction. SR 83-45. July 1983. J. N. Joyner, R. Vineberg, and M. R. Flaningam.

A handbook and associated study guide and test forms were developed to assist instructors in individualizing courses. The handbook is designed primarily for use at formal school settings and for professional military education courses, but may have potential applications to other training settings.

Engagement Simulation (ES) Training of U.S. Marine Corps Units. SR 83-46. July 1983. W. DeGraf and D. Erikson.

The object of this preliminary study was to assess the feasibility of employing automated engagement simulation training techniques to meet USMC combat training

requirements. Combat-related training goals were derived from existing documentation and appropriate engagement simulation system options were identified. The necessary simulations appear to be feasible and increasingly cost-effective. Accelerated use of engagement simulation training is recommended.

Requirement for Developing a Mine Detection and Classification Training Capability. SR 83-48. August 1983. H. L. Williams.

Mine, equipment, and mission parameters combine with parameters of the undersea environment to create a complex visual presentation on the minehunting sonar display. Because of the magnitude and complexity of the presentation, one cannot expose sonar trainees to all possible operational and environmental situations within which they may be required to perform. At best, only a part, a sample, could be captured and presented to sonar trainees. Given that such a sample could be developed, the Navy presently lacks the capability to present it to sonar trainees. Problems associated with establishing and maintaining training minefields, plus the limitations on the amount of time MCM ships can spend at sea, severely limits the potential benefits that such real ocean experience could provide. Yet, shipboard imbedded training equipment presently under development lacks the capability for training sonar operators in mine detection and classification.

It was recommended that a four-phase effort be conducted to (1) define the sample of mines and the minehunting environments that must be presented to sonar trainees, (2) relate this sample to the equipment capabilities required to present it, (3) develop an imbedded and/or dockside capability for presenting the sample and developing sonar operator skills, and (4) evaluate results.

Electronic Equipment Maintenance Training (EEMT) System: Development of Test and Evaluation Syllabus and Curricula. SR 83-50. September 1983. J. E. Brown, J. W. Schuler, H. D. Kribs, L. J. Mark, V. M. Malec, and G. F. Lahey.

The electronic equipment maintenance training (EEMT) system is being developed to augment electronics-oriented training at the "A" school level. It is intended to reduce reliance on the use of actual equipment trainers and to provide a vehicle for practicing generic and representative electronic equipment preventive and corrective maintenance procedures by means of self-paced computer-assisted and computer-managed instruction. This report describes the development of a syllabus to support EEMT system test and evaluation (T&E) in two Navy electronics training Class "A" schools. It contains curriculum outlines for three functional (generic) systems and three representative systems used to develop lesson specifications for system T&E implementation.

Manual for In-service Training of Instructors: Academic Remediation, Motivation, and Attitudes. SR 83-51. September 1983. J. P. Smith.

This report describes a 6-hour in-service training program for Navy instructors. The instructional method used is a highly structured peer group discussion designed to elicit a wide range of comments describing instructors' interactions with students. This process identifies good and poor practices and results in a group consensus regarding the most desirable instructor behavior. The views of individuals that coincide with the consensus are reinforced, while those individuals whose views differ

often decide to adopt the constructive model of respected peers. Four topics--Navy training goals, academic remediation, motivation, and attitudes--are addressed in the form of discussion questions. Common responses are provided to help the discussion leader evaluate progress and vary the conduct of the discussion to achieve the program objectives. A section on discussion-leading techniques is included.

Project STEAMER: VIII. System Evaluation by Navy Propulsion Engineering Training Personnel. SR 83-52. September 1983. A. Stevens and E. Hutchins.

The STEAMER computer-based propulsion engineering training system was installed at the Surface Warfare Officers School in Newport, R.I. and made available for use by Propulsion Plant Trainer instructors. The instructors felt that the STEAMER system could make a valuable contribution to propulsion training and suggested many potential uses for the system in support of training. Also, observations of their use of STEAMER revealed a number of ways in which the user interface could be improved. The results of this evaluation are being incorporated into the STEAMER development process and a subsequent evaluation period involving both students and instructors is being planned.

HUMAN PERFORMANCE

TECHNICAL REPORTS

Accuracy, Timeliness, and Useability of Experimental Source Data Modules. TR 83-1. November 1982. J. S. Malone, R. W. Obermayer, E. R. N. Robinson, and K. H. Funk.

Three computer interface systems were developed and tested in a Navy Pay/Personnel Administrative Support System (PASS) office. These three systems were used to analyze personnel performance times, errors, and the effects of computer system parameters on error rates. This report describes the interface systems, discusses their advantages and limitations, and provides recommendations for the future development of a source data entry module for use in personnel office information systems.

Validation of Brain Event-related Potentials as Indicators of Cognitive Styles, Abilities, and Aptitudes. TR 83-11. February 1983. P-A. Federico, J. N. Froning, and M. Calder.

Fifty Navy recruits were given 11 paper-and-pencil tests of cognitive styles, abilities, and aptitudes. Visual, auditory, and bimodal brain event-related potential (ERP) amplitudes were recorded from each of these subjects. Product-moment and canonical correlational analyses, as well as principal-factor analysis and varimax rotation, were conducted. Product-moment correlations indicated that some cognitive attributes were significantly associated with some ERPs. Cognitive characteristics that contributed to the significant canonical correlations were general aptitude, verbal comprehension, spatial ability, field dependence-independence, conceptualizing style, and reflection-impulsivity, as well as ERPs in the right temporal and parietal areas and left frontal and parietal areas. Some ERPs and cognitive characteristics defined the same underlying dimensions, implying that they are related. The results demonstrated the construct validity of ERPs as indicators of individual differences in cognitive characteristics, especially crystallized and fluid intelligence.

Brain Event-related Potential Correlates of Concept Learning. TR 83-16. May 1983. P-A. Federico.

An auditory probe procedure was employed to evoke brain event-related potentials (ERPs) in 56 Navy recruits while they learned pulsed radar concepts presented to them in study booklets. A mastery test was administered to assess concept acquisition. Test items became criteria for multiple regression and discriminant analyses using as predictors ERP amplitudes that correspond to specific concepts. One regression analysis and its associated statistics indicated that ERPs recorded at the right temporal and parietal areas are significantly related to concept acquisition. Three discriminant analyses and their subsequent statistics revealed that ERPs evoked at the right frontal, temporal, parietal, and occipital and the left parietal regions significantly distinguished below- from above-average concept learners. Poorer learners engaged the right frontal and temporal regions less and with greater variability than did better learners, possibly because they processed less concept-related information at these brain locations. This study established that the right frontal, temporal, and parietal areas are significantly associated with concept learning--not only left hemisphere regions as proposed in the popular asymmetric model of the brain.

HUMAN PERFORMANCE (Continued)

Methods for Improving the User-computer Interface. TR 83-29. August 1983. P. H. McCann.

Requirements of the personal computer user are identified and contrasted with computer designer perspectives towards the user. The user's psychological needs are described so that the design of the user-computer interface may be designed to accommodate them. Development of the user-computer interface is discussed in terms of the user's physical, perceptual, and conceptual contacts with the system. The ideals of system design--transparency and visibility to the user--are described. Further research is suggested that will explore the characteristics of efficacious menu selection, develop a theory of the operator, determine the best locus of control for dialogue features, provide guidelines for improving system documentation, and improve user work station habitability.

SPECIAL REPORTS

Ship-initiated Microcomputer Applications: Lessons Learned. SR 83-5. November 1982. J. A. Dollard.

To determine the effect of ship-initiated microcomputer applications upon general shipboard administration, a microcomputer with a data management system (DMS) and word processing system (WPS) capability was placed in two Navy combatant ships. Over 80 DMS and 200 WPS applications were developed and used by the ships. These applications were observed to facilitate control of shipboard administration and to reduce paperwork. Areas discussed include application design and development, system reliability and maintainability, system operations and utility, system personnel and logistic support, system benefits, and system costs. Lessons learned are listed.

Collision Avoidance System (CAS): Human Factors Engineering Evaluation. SR 83-9. December 1982. D. H. Sass and H. L. Williams.

The collision avoidance system (CAS), a computerized navigational aid that was installed aboard a Navy ship for test and evaluation, provided senior bridge officers with reliable information that enabled them to make a rapid assessment of threatening situations and react acccordingly. Although its effectiveness was impaired because of inadequate and inconsistent labeling of controls, inconsistent information display methods, and inefficient layout of controls, CAS is considered to be a beneficial navigational aid. Operator training requirements are minimal and CAS has no impact on manpower requirements. Proposed changes in redesigning CAS data display presentations, controls, and control panels were developed to eliminate the human engineering deficiencies identified to the extent possible. Also, a format for an operation manual and training guide for CAS was developed.

Design Guide to Operator and Technician Requirements: Volumes 1-6. SR 83-14. February 1983. R. A. Dick and M. C. McCallum.

The design guide series contains data that system acquisition planners and system designers can use to select features for new systems that will minimize the

required number and skill level of operators and technicians. Data are presented on the predicted impact of 66 design alternatives on future operator proficiency, maintenance technician proficiency, maintenance time, system acquisition costs, and life cycle costs. Detailed task data are presented on the estimated percentage of Navy technicians who can correctly perform operation and maintenance tasks without supervision for a variety of current electronic weapon systems. Specific design problems related to difficult tasks are identified in current systems and recommended changes are provided.

Conditions Influencing Skill Deterioration: A Survey of Three Navy Sonar Communities. SR 83-18. March 1983. S. K. Wetzel and W. E. Montague.

Three Navy communities--aviation, subsurface, and surface--require personnel skilled in using passive sonar techniques to detect and classify enemy ships. Thus, to identify conditions leading to skill loss in the Navy's three sonar communities, structured interviews were conducted with subject matter experts from each community. Interview results showed that the three communities differed as to initial training, frequency and quality of practice and performance feedback, and lengths of periods of task nonutilization. Interpretations of these findings indicated that the knowledge and skills required of acoustic analysts assigned to S-3A and P-3 platforms would be maintained at relatively high levels. However, those required of acoustic analysts assigned to helicopters, submarines, and ships will be degraded over time. Recommendations were made to address the problem.

Behavioral Inputs to the Weapon System Acquisition Process (WSAP). SR 83-21. March 1983. D. Meister.

The Navy's weapon systems are often designed with inadequate attention being paid to human factors considerations, with consequent reduction in system performance. To ensure that behavioral inputs are made to the weapon system acquisition process, they must be made to the various reviews conducted by the Defense System Acquisition Review Council (DSARC). This report describes the behavioral inputs required and the DSARC phases to which they are relevant. It describes the documents into which inputs must be inserted, the DSARC behavioral questions that should be asked, and the behavioral techniques that should be implemented.

Prevention of Boiler Explosions in Aircraft Carrier Main Propulsion Systems: Personnel Factors (AL-2-81). SR 83-25. April 1983. R. N. Harris.

This investigation deals with personnel-related causes of main propulsion boiler explosions in aircraft carriers (CVs). This report specifically addresses whether operators can detect and diagnose 22 potentially explosive conditions (PECs). Data were collected by interviews with engineering personnel and by observations of operations on CVs underway. The data show that PECs are often diagnosed by junior enlisted personnel who usually do not have the experience and knowledge needed to interpret the information available to them properly. Recommendations are made for actions to reduce personnel-related causes to boiler explosions.

Estimating Skill Degradation for Sonar Technicians (Surface) (STGs): Assessment of Job and Training Variables. SR 83-26. April 1983. S. K. Wetzel, P. J. Konoske, and W. E. Montague.

A sample of experienced sonar technicians (surface) (STGs) was administered an experimental survey questionnaire designed to provide information about initial training and job conditions associated with critical sonar tasks. Performance tests were then used to measure their performance on these tasks. Results indicated that the questionnaire measure was successful in predicting sonar operator performance in the STG community. It is likely that this general technique could be used to assess skill degradation/maintenance in other technical ratings as well.

Estimating Skill Degradation for Aviation Antisubmarine Warfare Operators (AWs): Assessment of Job and Training Variables. SR 83-28. April 1983. P. J. Konoske, S. K. Wetzel, and W. E. Montague.

A sample of experienced aviation antisubmarine warfare operators (AWs) was administered an experimental survey questionnaire designed to provide information about the quality of initial training and job conditions associated with acoustics analysis. Performance tests were then used to measure their performance on acoustic analysis tasks. Results indicated that the questionnaire measure was successful in predicting sonar operator performance in the AW community. It is likely that this general technique could be used to assess skill degradation/maintenance in other technical ratings as well.

Estimating Skill Degradation for Aviation Antisubmarine Warfare Operators (AWs): Loss of Skill and Knowledge Following Training. SR 83-31. May 1983. S. K. Wetzel, P. J. Konoske, and W. E. Montague.

Subjects, 20 AWs in the S-3A training pipeline who attended a basic acoustic analysis course and a follow-on operator course, were tested to determine if they retained the skills and knowledge required for satisfactory performance of acoustic analysis and classification over the 25-day nonutilization period between the two courses. The original learning measure was the basic course final examination, comprised of (1) a multiple-choice knowledge exam consisting of both factual and computational items, and (2) a performance test that examined student performance of acoustic analysis and classification procedures on static linear lofargrams. The retention measure, administered approximately 1 month later, consisted of alternate forms of the original measure. Results showed that students performed better on the original measure than on the retention tests for most of the variables analyzed. Significant differences were found for all scores on the knowledge test (overall, the factual test items, and the computational test items) and for performance for the analysis variables on the performance test. No significant differences were found for the classification variable. It was concluded that, over the 25-day nonutilization period, the skills and knowledge of students in the S-3A acoustic analyst training pipeline degraded significantly.

Effects of Display Format on Sonar Operator Performance. SR 83-37. May 1983. S. K. Wetzel, P. J. Konoske, and W. E. Montague.

The objective of this research was to determine whether the test currently used to measure proficiency in acoustic analysis, which differs substantially from the OL-82 sonar system used in the fleet, provides an accurate estimate of operator on-the-job performance. Subjects (22 AWs enrolled in the Air Antisubmarine Squadron

Forty-one (VS-41) operator course) were administered six single target grams to analyze and classify on the OL-82 sonar system simulator; and six, using static lofargrams. Measures of acoustic analysis (identification of sound source, predominant spectrum, and propeller mode), and classification (accurate identification of the target) decisions were obtained under both testing situations.

Subject performance on the analysis variables differed significantly for the two display formats. Subjects more accurately identified predominant spectrum, sound source, and propeller mode on the OL-82 sonar system simulator than they did on the static linear lofargrams. Subjects' performance on the classification task was not significantly different for the two display formats. It was concluded that operator proficiency on the OL-82 sonar system simulator, at least for AWs in the training pipeline, cannot be estimated accurately using static linear lofargrams.

Interactive Simulation of Mine Countermeasures Operations. SR 83-49. August 1983. F. L. Greitzer, R. T. Kelly, and R. L. Hershman.

An interactive desktop computer simulation was developed to support system design for the MCM-1 mine countermeasures ship. Eight parameters govern characteristics of the minefield, ship sonar, and detection and classification functions. As the operator moves the ship through the field in fast time, interactive graphics display ship's position, the sonar search sector, and all detections, classifications, and detonations. A summary of performance data is displayed at the end of a run.

Quality Assessment of a Navy Operator Training Course. SR 83-53. September 1983. S. K. Wetzel, P. J. Konoske, and W. E. Montague.

Although Navy technical personnel are often required to perform cognitively complex tasks, training in most Navy technical schools still relies on instructional methods designed for teaching procedural tasks. The quality of instruction at a Navy operator school designed to teach passive acoustic analysis was evaluated using three criteria: (1) the structural organization of the course, (2) the quality of feedback and remediation, and (3) testing methods used to evaluate student performance. Deficiencies found in the structural organization of the course included no clear conceptual model of the task, an overemphasis on discrete facts, and presentation of topics that were not practiced or tested as skills. Deficiencies in the quality of feedback included little diagnosis of repeated subprocedure errors and, because of the lack of a clear conceptual model of the task, no way for students to evaluate their own performance. Provision for remediation of specific problem areas in the task was poor. Deficiencies in testing were noted because of the emphasis on recognizing discrete facts rather than demonstrating conceptual understanding of the task. Recommendations for course improvements were made.

TECHNICAL NOTES

Effects of System-Timing Parameters on Operator Performance in a Personnel Records Task. TN 83-1. November 1982. R. C. Williges and B. H. Williges.

Meaningful human factors applications to the design of human/computer tasks require a quantitative data base that decribes operator behavior as a function of various independent variables. Three classes of metrics--operator satisfaction

ratings, work sampling procedures, and embedded performance measurement--are described as important measures in evaluating human/computer interfaces. Polynomial regression procedures were used to generate functional relationships between each of these classes of metrics and four independent variables representing timing attributes of an interactive computer system used to enter and update personnel records (system delay, display rate, keyboard echo rate, and rollover buffer length of the keyboard). Each of the 22 dependent variables in the three classes of metrics showed different functional relationships among the four system variables, but overall system delay and keyboard echo rate were the major predictors of operator behavior. Additionally, the three classes of metrics were combined into the three underlying interface dimensions relating to operator production, waiting, and planning activities.

A Portable Measurement and Recording System for Ship Motion Data or Other Analog Signals. TN 83-2. January 1983. R. A. Newman.

This report describes the development of a portable measurement and recording system for ship motion data or other analog signals.

Biotechnology Predictors of Physical Security Personnel Performance: I. A Review of the Stress Literature Related to Performance. TN 83-9. June 1983. E. R. N. Robinson.

The overall purpose of this project is to assess the stability and reliability of such biotechnology predictors as brain event-related potentials (ERPs) in order to use them as performance predictors and assessors against baseline conditions. Comparisons will then be made between candidate ERPs. This report provides (1) an annotated bibliography on stress as related to security guard performance and (2) guidelines for a laboratory task that would discriminably measure brain wave recordings of people experiencing stress.

R&D METHODS AND TECHNIQUES

TECHNICAL REPORTS

Influence of Fallible Item Parameters on Test Information During Adaptive Testing. TR 83-15. April 1983. C. D. Wetzel and J. R. McBride.

Computer simulation was used to assess the effects of item parameter estimation errors on different item selection strategies used in adaptive and conventional testing. To determine whether these effects reduced the advantages of certain optimal item selection strategies, simulations were repeated in the presence and absence of item parameter estimation errors. Results showed that item parameter estimation errors had little effect on the efficiency and measurement precision of the adaptive test item selection strategies studied. Strategies that explicitly made optimal use of item parameters for item selection were superior to a less optimal strategy, even when item parameters were fallibly estimated. It appears that errors in the item parameter estimates do not reduce the psychometric advantages of these "optimal" strategies. Item selection strategies that explicitly employ optimization criteria should be regarded as preferable to simpler strategies that do not. Further development of psychometric procedures for the computerized adaptive testing (CAT) system should focus on the former type of strategy.

Tailored Testing Theory and Practice: A Basic Model, Normal Ogive Submodels, and Tailored Testing Algorithms. TR 83-32. August 1983. V. W. Urry.

In this report, selection theory is used as a theoretical framework from which mathematical algorithms for tailored testing are derived. The process of tailored, or adaptive, testing is presented as analogous to personnel selection and rejection on a series of continuous variables that are related to ability. Proceeding from a single common-factor model, the author derives the two- and three-parameter normal ogive item response functions as submodels. For both of these submodels, algorithms are developed for sequential item selection, ability estimation, and test termination in the context of adaptive ability testing. It is shown that the adaptive testing method based on these algorithms is formally identical to a previously developed Bayesian sequential tailored testing procedure.

SPECIAL REPORTS

Planning and Prioritizing People-related Research and Development in the Navy. SR 83-12. January 1983. L. M. Doherty and H. R. Seymour.

This report describes a quantitative procedure for prioritizing people-related R&D requirements in the Navy and initiatives taken to reduce R&D program fragmentation.

Analysis of FY82 User Responses to NAVPERSRANDCEN Research Utilization Evaluations. SR 83-29. April 1983. B. M. Griswold and H. H. Rosen.

In FY81, NAVPERSRANDCEN developed a user-oriented system for assessing user response to Center products. In this system, identified users are asked to review a Center product and evluate it on various aspects. Results indicate that the system has great potential for initiating and maintaining a productive dialogue between researchers and operational consumers. Data provided can be used to improve the quality of R&D management decisions by offering both long-term trend information and immediate feedback regarding product utilization. This report analyzes FY82 user evaluations.

BIBLIOGRAPHIES, REVIEWS, AND SUMMARIES

TECHNICAL REPORT

Bibliography: Unclassified Technical Reports, Special Reports, and Technical Notes--FY 1982. TR 83-3. November 1982.

This report lists all unclassified technical reports, special reports, and technical notes that have been published by the Center in FY 1982. Publications in each category are listed in chronological order under seven areas: manpower management, personnel administration, organization management, education and training, human performance, R&D methods and techniques, and bibliograpies, reviews, and summaries.

SPECIAL REPORTS

A Digest of Retention Terms: Definition and Historical Values. SR 83-24. April 1983. M. K. Nakada, R. H. Mumm, and E. W. Curtis.

The large number of concepts and terms used in retention research leads to apparent contradictions among findings and an inability to corroborate findings. Thus, to aid future researchers in personnel retention, a set of terms has been identified. For these terms, the following were provided: Definition, reference material, mathematical formula (if applicable), and historical values (if available).

Independent Research and Independent Exploratory Development at the Navy Personnel Research and Development Center--FY82. SR 83-27. April 1983. D. J. Chesler (Editor).

This report provides synopses of FY81-82 IR/IED projects, the IR/IED funding profile, and a list of publications and presentations on IR/IED projects.

Human Individual Differences in Military Systems. SR 83-30. April 1983. R. C. Sorenson (Editor).

This report is based on presentations concerning human individual differences and their implications at the Joint National Meeting of the Operations Research Society of America and The Institute of Management Sciences, held in San Diego in October 1982.

TECHNICAL NOTES

A Survey of Data-based Information Systems Relevant to Navy Requirements Planning. TN 83-4. February 1983. R. H. Mumm.

This report describes eight data-based information systems that are related to Navy requirements planning. Each system is described in terms of its background, purpose, resident computer, major data files, limitations, and future developments. Record formats and samples of files are provided. Also, system characteristics are summarized in a reference table.

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